APR 15 1989

FLOOD INSURANCE STUDY

TOWNSHIP OF LOCKPORT, MICHIGAN

ST. JOSEPH COUNTY

FEBRUARY 17, 1989

Federal Emergency Management Agency

COMMUNITY NUMBER - 260715

NOTICE TO
FLOOD INSURANCE STUDY USERS

Communities participating in the National Flood Insurance Program have established repositories of flood hazard data for floodplain management and flood insurance purposes. This Flood Insurance Study may not contain all data available within the repository. It is advisable to contact the community repository for any additional data.

TABLE OF CONTENTS

		Page
1.0	INTRODUCTION	1
1.1	Purpose of Study	1
1.2	Authority and Acknowledgments	1
1.3	Coordination	1
2.0	AREA STUDIED	1
2.1	Scope of Study	1
2.2	Community Description	3
2.3	Principal Flood Problems	3
2.4	Flood Protection Measures	3
3.0	ENGINEERING METHODS	4
3.1	Hydrologic Analyses	4
3.2	Hydraulic Analyses	5
4.0	FLOODPLAIN MANAGEMENT APPLICATIONS	6
4.1	Floodplain Boundaries	6
4.2	Floodways	7
5.0	INSURANCE APPLICATION	7
6.0	FLOOD INSURANCE RATE MAP	8
7.0	OTHER STUDIES	8
8.0	LOCATION OF DATA	8
9.0	REFERENCES AND BIBLIOGRAPHY	8

TABLE OF CONTENTS (continued)

Page

FIGURE

Figure 1 - Vicinity Map 2

TABLE

Table 1 - Summary of Discharges 5

EXHIBITS

Flood Profiles

St. Joseph River Panels 01P-03P
Portage River Panel 04P

Flood Insurance Rate Map Index
Flood Insurance Rate Map

Elevation Reference Marks

FLOOD INSURANCE STUDY

TOWNSHIP OF LOCKPORT,
ST. JOSEPH COUNTY,
MICHIGAN

1.0 INTRODUCTION

1.1 Purpose of Study

This Flood Insurance Study investigates the existence and severity of flood hazards in the Township of Lockport, St. Joseph County, Michigan, and aids in the administration of the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973. This study has developed flood risk data for various areas of the community that will be used to establish actuarial flood insurance rates and assist the community in its efforts to promote sound floodplain management. Minimum floodplain management requirements for participation in the National Flood Insurance Program are set forth in the Code of Federal Regulations at 44 CFR, 60.3.

In some states or communities, floodplain management criteria or regulations may exist that are more restrictive or comprehensive than the minimum Federal requirements. In such cases, the more restrictive criteria take precedence and the state (or other jurisdictional agency) will be able to explain them.

1.2 Authority and Acknowledgments

The sources of authority for this Flood Insurance Study are the National Flood Insurance Act of 1968 and the Flood Disaster Protection Act of 1973.

The hydrologic and hydraulic analyses for this study were performed by U.S. Geological Survey (USGS) (the Study Contractor) for the Federal Emergency Management Agency (FEMA), under Inter-Agency Agreement No. EMW-85-E-1823. This study was completed in December 1986.

1.3 Coordination

On March 18, 1988, the results of this Flood Insurance Study were reviewed and accepted at a final coordination meeting attended by representatives of the Study Contractor, FEMA, and the community.

2.0 AREA STUDIED

2.1 Scope of Study

This Flood Insurance Study covers the incorporated area of the Township of Lockport, St. Joseph County, Michigan. The area of study is shown on the Vicinity Map (Figure 1).

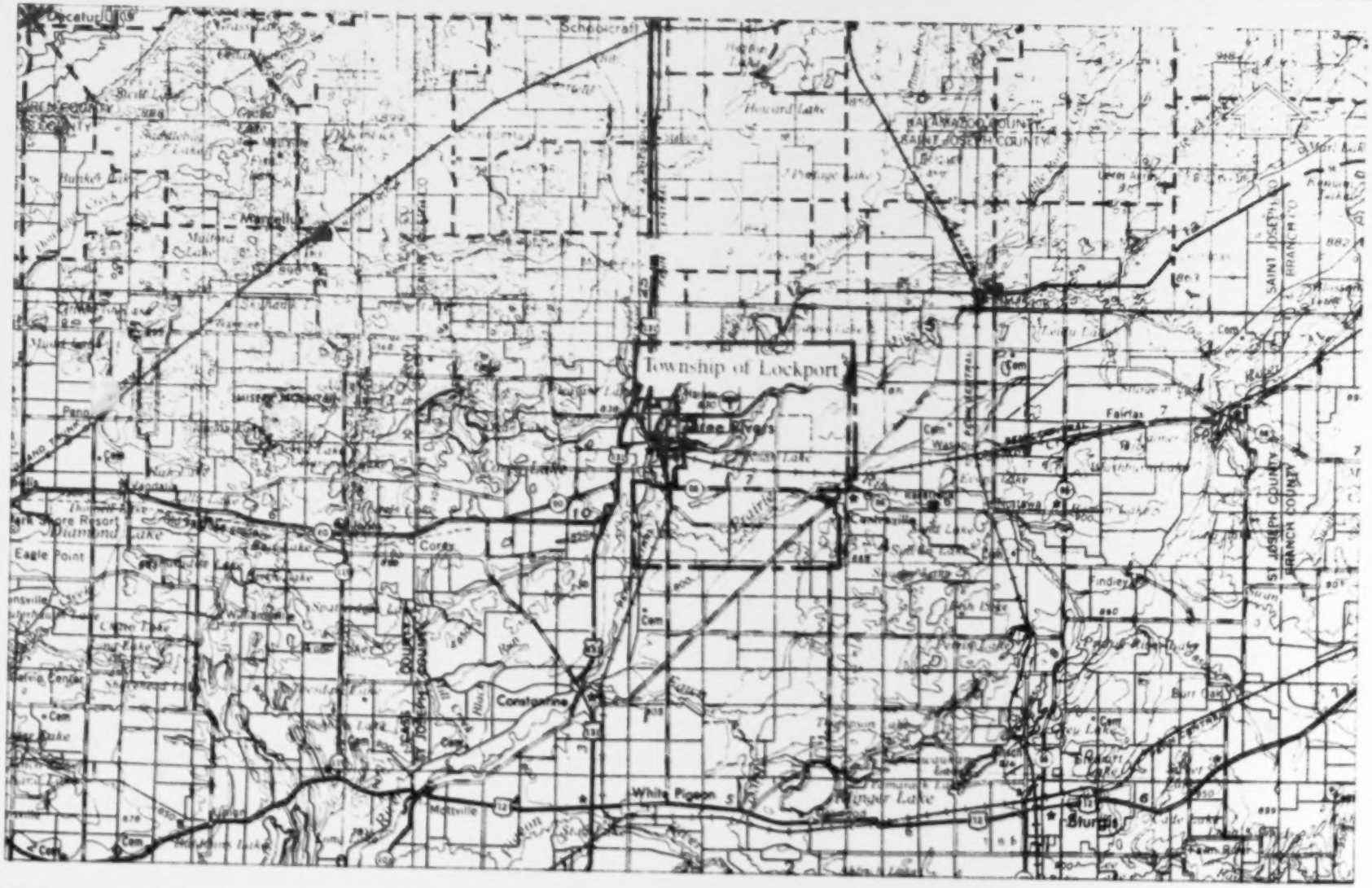


FIGURE 1

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF LOCKPORT, MI
(ST. JOSEPH CO.)

APPROXIMATE SCALE

4 0 4 8 12 MILES

VICINITY MAP

Flooding caused by overflow of the St. Joseph River and the Portage River was studied in detail.

Approximate analyses were used to study those areas having a low development potential or minimal flood hazards.

The Prairie River was studied by approximate methods because of the sparse development within its floodplains.

The areas studied were selected with priority given to all known flood hazard areas and areas of projected development or proposed construction through December 1991. The scope and methods of study were proposed to and agreed upon by FEMA and the Township of Lockport.

2.2 Community Description

The Township of Lockport is in northwestern St. Joseph County in southwestern Michigan. Lockport is bordered by Park Township on the north, Nottawa Township and the City of Centerville on the east, Florence Township on the south, and Fabius Township and the City of Three Rivers on the west. The township is served by U.S. Highway 131, State Highways 60 and 86, and Conrail. The 1980 population of Lockport was reported to be 3,048 (Reference 1).

2.3 Principal Flood Problems

The flood elevations for the St. Joseph River within the Township of Lockport are affected by the operation of the Fairbanks Morse Dam in Three Rivers and by the Sturgis Dam, located 6.7 miles upstream. The Portage Plant Dam on the Portage River, about 1.5 miles upstream from its confluence with the St. Joseph River in Three Rivers, also affects flood elevations in Lockport.

The largest flood recorded at USGS gaging station number 04097500 on the St. Joseph River at Three Rivers occurred on April 27, 1950. Based on historical information and nearby gaging station analyses, the 1950 flood is considered to be the largest flood since 1918 (Reference 2). The maximum streamflow during the 1950 flood was 8,260 cubic feet per second (cfs). This discharge corresponds to that of a 95-year recurrence interval flood. The second greatest flood during the period of data collection occurred on March 21, 1982, and had a discharge of 8,180 cfs.

2.4 Flood Protection Measures

Along the St. Joseph River, dam operators coordinate floodflow releases to mitigate flood hazards. The operating policies for both dams on the St. Joseph River prevent excessive flood damage.

3.0 ENGINEERING METHODS

For the flooding sources studied in detail in the community, standard hydrologic and hydraulic study methods were used to determine the flood hazard data required for this study. Flood events of a magnitude that is expected to be equaled or exceeded once on the average during any 10-, 50-, 100-, or 500-year period (recurrence interval) have been selected as having special significance for floodplain management and for flood insurance rates. These events, commonly termed the 10-, 50-, 100-, and 500-year floods, have a 10-, 2-, 1-, and 0.2-percent chance, respectively, of being equaled or exceeded during any year. Although the recurrence interval represents the long-term average period between floods of a specific magnitude, rare floods could occur at short intervals or even within the same year. The risk of experiencing a rare flood increases when periods greater than 1 year are considered. For example, the risk of having a flood that equals or exceeds the 100-year flood (1-percent chance of annual exceedence) in any 50-year period is approximately 40 percent (4 in 10), and, for any 90-year period, the risk increases to approximately 60 percent (6 in 10). The analyses reported herein reflect flooding potentials based on conditions existing in the community at the time of completion of this study. Maps and flood elevations will be amended periodically to reflect future changes.

3.1 Hydrologic Analyses

Hydrologic analyses were carried out to establish the peak discharge-frequency relationships for each riverine flooding source studied in detail affecting the community.

Data from the gaging station on the St. Joseph River at Three Rivers were analyzed using Bulletin No. 17B (Reference 3). The flood frequency magnitude relationship was determined using data from 65 years of record and a regionalized flood skew coefficient of 0.081 (Reference 4).

For the Portage River, the flood frequency magnitude relationship was based on regional flood frequency equations (Reference 5) and 25 years of peak flow data from USGS gaging station number 04097170 on the Portage River 19.4 miles upstream of its mouth near the Village of Vicksburg.

Peak discharge varies with drainage area along the St. Joseph River and the Portage River. Therefore, the 100-year peak discharges for the St. Joseph River and the Portage River at the gaging stations were adjusted to obtain peak discharge within Lockport.

Peak discharge-drainage area relationships for the 100-year flood of each flooding source studied in detail in the community are shown in Table 1.

TABLE 1 - SUMMARY OF DISCHARGES

FLOODING SOURCE AND LOCATION	DRAINAGE AREA (SQ MILES)	PEAK DISCHARGE (CFS) 100-YEAR
ST. JOSEPH RIVER		
at gaging station no. 04097500	1,350	8,280
just upstream of Fairbanks Morse Dam	985	6,260
just upstream of Sturgis Dam	974	6,200
PORTAGE RIVER		
at gaging station no. 04097170	68.2	462
just upstream of Portage Plant Dam	192	1,200

3.2 Hydraulic Analyses

Analyses of the hydraulic characteristics of flooding from the sources studied were carried out to provide estimates of the elevations of floods of the selected recurrence intervals.

Procedures for control of flood elevations on the St. Joseph River are set forth in the operating guidelines for the Fairbanks Morse Dam and the Sturgis Dam. However, operating policies for these dams are not practically defined for all flow conditions, and operator intervention is required in order to control the flood elevations. Spillway capacities for the Fairbanks Morse Dam and for the Sturgis Dam are sufficient to control the 100-year flood without causing property damage immediately upstream of the dams (References 6 and 7).

Since no operator intervention is expected for reducing flood hazards at the Portage Plant Dam, the 100-year flood elevations on Hoffman Pond were based on computations of flow over the spillway with three feet flashboards in place upstream of Hoffman Pond. Flood elevations on the Portage River were based on backwater analyses. Five cross sections were obtained from field surveys and seven were synthesized. The synthesized cross sections were estimated from adjacent surveyed cross sections and USGS topographic maps (Reference 8). Structural geometry and elevations for two bridges and road sections were obtained from field survey. Flood elevations on Fishers Lake (a tributary of the Portage River) and Noah Lake (a tributary of the St. Joseph River) were also based on backwater analyses using cross-section and hydraulic data provided by the Michigan Department of Natural Resources (Reference 9).

Locations of selected cross sections used in the hydraulic analyses are shown on the Flood Profiles.

Channel roughness factors (Manning's "n") used in the hydraulic computations were chosen by engineering judgment and based on field observations of the floodplain areas. Roughness values average 0.045 for the channel and range from 0.090 to 0.120 for the overbank areas. Water-surface elevations for the 100-year flood were computed by WSPRO, a step-backwater computer program (Reference 10). Flood profiles were drawn showing computed water-surface elevations to a plotted accuracy of 0.5 foot for the 100-year flood. The flood profiles show the streambed elevations and location of bridges, cross sections, and the confluences of the tributaries. Due to the uncertainty of the operation of the dams during emergency conditions and the need for elevations between the dams, historical flood information was also used to estimate the 100-year flood. High-water profiles prepared by the U.S. Army Corps of Engineers (Reference 11) from the 1950 and the 1908 floods were used to develop a flood profile. Generally, 100-year flood elevations were established 0.2 foot higher than the 1950 high-water profile. This adjustment is necessary because of the greater severity of the 100-year flood, yet reflects the expected actions by dam operators to minimize flood damages.

Flood profiles were drawn showing the computed water-surface elevations for floods of the selected recurrence intervals.

The hydraulic analyses for this study are based on the effects of unobstructed flow. The flood elevations shown on the profiles are thus considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Elevation reference marks used in this study are shown on the map and described in the exhibit labeled Elevation Reference Marks.

4.0 FLOODPLAIN MANAGEMENT APPLICATIONS

The National Flood Insurance Program encourages State and local governments to adopt sound floodplain management programs. Therefore, each Flood Insurance Study provides 100-year flood elevations and delineations of the 100- and 500-year floodplain boundaries and 100-year floodway to assist communities in developing floodplain management measures.

4.1 Floodplain Boundaries

To provide a national standard without regional discrimination, the 1-percent annual chance (100-year) flood has been adopted by FEMA as the base flood for floodplain management purposes. The 0.2-percent annual chance (500-year) flood is employed to indicate additional areas of flood risk in the community. For each stream studied in detail, the 100- and 500-year floodplain boundaries have been delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries

were interpolated using topographic maps at a scale of 1:24000 with a contour interval of 10 feet (Reference 8).

The 100-year floodplain boundary is shown on the Flood Insurance Rate Map. On this map, the 100-year floodplain boundary corresponds to the boundary of the areas of special flood hazards (Zones A, AE, AH, AO, A99, V, and VE). Small areas within the floodplain boundaries may lie above the flood elevations but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

For the streams studied by approximate methods, only the 100-year floodplain boundary is shown on the Flood Insurance Rate Map.

4.2 Floodways

The floodway is the channel of a stream plus any adjacent floodplain areas that must be kept free of encroachment so that the 100-year flood can be carried without substantial increases in flood heights.

Floodways have not been shown or computed for this community. Along streams where floodways have not been computed, the community must ensure that the cumulative effect of development in the floodplain will not cause an increase in the base flood elevations greater than the State's allowable surcharge at any point within the community.

5.0 INSURANCE APPLICATION

For flood insurance rating purposes, flood insurance zone designations are assigned to a community based on the results of the engineering analyses. These zones are as follows:

Zone A

Zone A is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by approximate methods. Because detailed hydraulic analyses are not performed for such areas, no base flood elevations or depths are shown within this zone.

Zone AE

Zone AE is the flood insurance rate zone that corresponds to the 100-year floodplains that are determined in the Flood Insurance Study by detailed methods. Whole-foot base flood elevations derived from the detailed hydraulic analyses are shown at selected intervals within this zone.

Zone X

Zone X is the flood insurance rate zone that corresponds to areas outside the 100-year floodplain, areas of 100-year flooding where average depths are less than 1 foot, areas of 100-year flooding where the contributing drainage area is less than 1 square mile, and areas protected from the 100-year flood by levees. No base flood elevations or depths are shown within this zone.

6.0 FLOOD INSURANCE RATE MAP

The Flood Insurance Rate Map is designed for flood insurance and floodplain management applications.

For flood insurance applications, the map designates flood insurance rate zones as described in Section 5.0 and, in the 100-year floodplains that were studied by detailed methods, shows selected whole-foot base flood elevations or average depths. Insurance agents use the zones and base flood elevations in conjunction with information on structures and their contents to assign premium rates for flood insurance policies.

For floodplain management applications, the map shows by tints, screens, and symbols the 100- and 500-year floodplains, the floodways, and the locations of selected cross sections used in the hydraulic analyses and floodway computations.

7.0 OTHER STUDIES

A Flood Insurance Study in progress for the Township of Nottawa, Michigan (Reference 12) is in agreement with this study.

This Flood Insurance Study supersedes the previously printed Flood Hazard Boundary Map for the Township of Lockport, Michigan (Reference 13).

8.0 LOCATION OF DATA

Information concerning the pertinent data used in the preparation of this study can be obtained by contacting the Natural and Technological Hazards Division, FEMA, 300 South Wacker Drive, Chicago, Illinois 60606.

9.0 REFERENCES AND BIBLIOGRAPHY

1. U.S. Department of Commerce, Bureau of the Census, 1980 Census of Population, Number of Inhabitants, Michigan, Washington, D.C., January 1982.

2. U.S. Geological Survey, Water Data Report MI-83-1, Water Resources Data for Michigan, Water Year 1983, J.B. Miller, J.L. Obert, and T. Sieger, Jr., 1983.

3. U.S. Department of the Interior, Geological Survey, Interagency Advisory Committee on Water Data, Office of Water Data Coordination, Hydrology Subcommittee, Bulletin No. 17B, Guidelines for Determining Flood Flow Frequency, September 1981, revised March 1982.

4. U.S. Geological Survey, Water Resources Investigations Report 83-4194, Estimating Generalized Flood Skew Coefficients for Michigan, H.M. Croskey and D.J. Holtschleg, 1983.

5. ————, Water Resources Investigations Report, Statistical Models for Estimating Flow Characteristics of Michigan Streams, D.J. Holtschleg and H.M. Croskey, 1984.

6. Michigan Department of Natural Resources and U.S. Army Corps of Engineers, Detroit District, National Dam Safety Program, Inspection Report, Inventory, Number 395, St. Joseph River Basin, Fairbanks Morse Dam.

7. Lawson-Fisher Associates, Engineering Report, Project Number 2964, Initial Inspection by Independent Consultant, City of Sturgis Michigan, 1984.

8. U.S. Geological Survey, 7.5 Minute Series Topographic Maps, Scale 1:24000, Contour Interval 10 Feet: Three Rivers East, Michigan, 1984.

9. Michigan Department of Natural Resources, Water Management Division, Written Communication, B. Menery, 1986.

10. U.S. Department of Transportation, Federal Highway Administration, Report No. FHWA/RD-86/108, Bridge Waterways Analysis Model: Research Report, J.O. Shearman, W.H. Kirby, V.R. Snyder, and H.N. Flippo, July 1986.

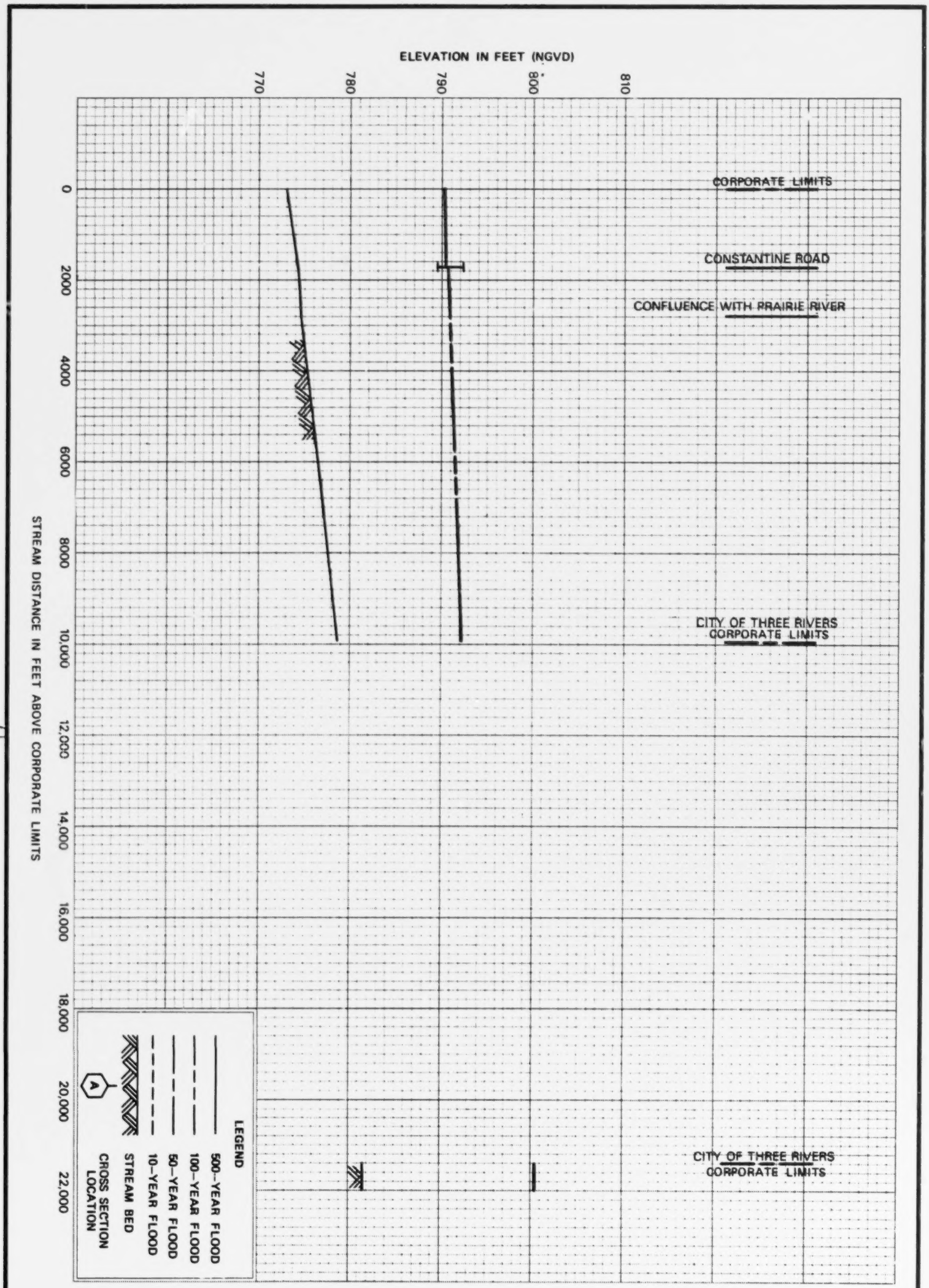
11. U.S. Army Corps of Engineers, Detroit District, St. Joseph River Michigan and Indiana Highwater Profile, April 1950 Flood and March 1908 Flood, 1965.

12. Federal Emergency Management Agency, Flood Insurance Study, Township of Nottowa, St. Joseph County, Michigan, in progress.

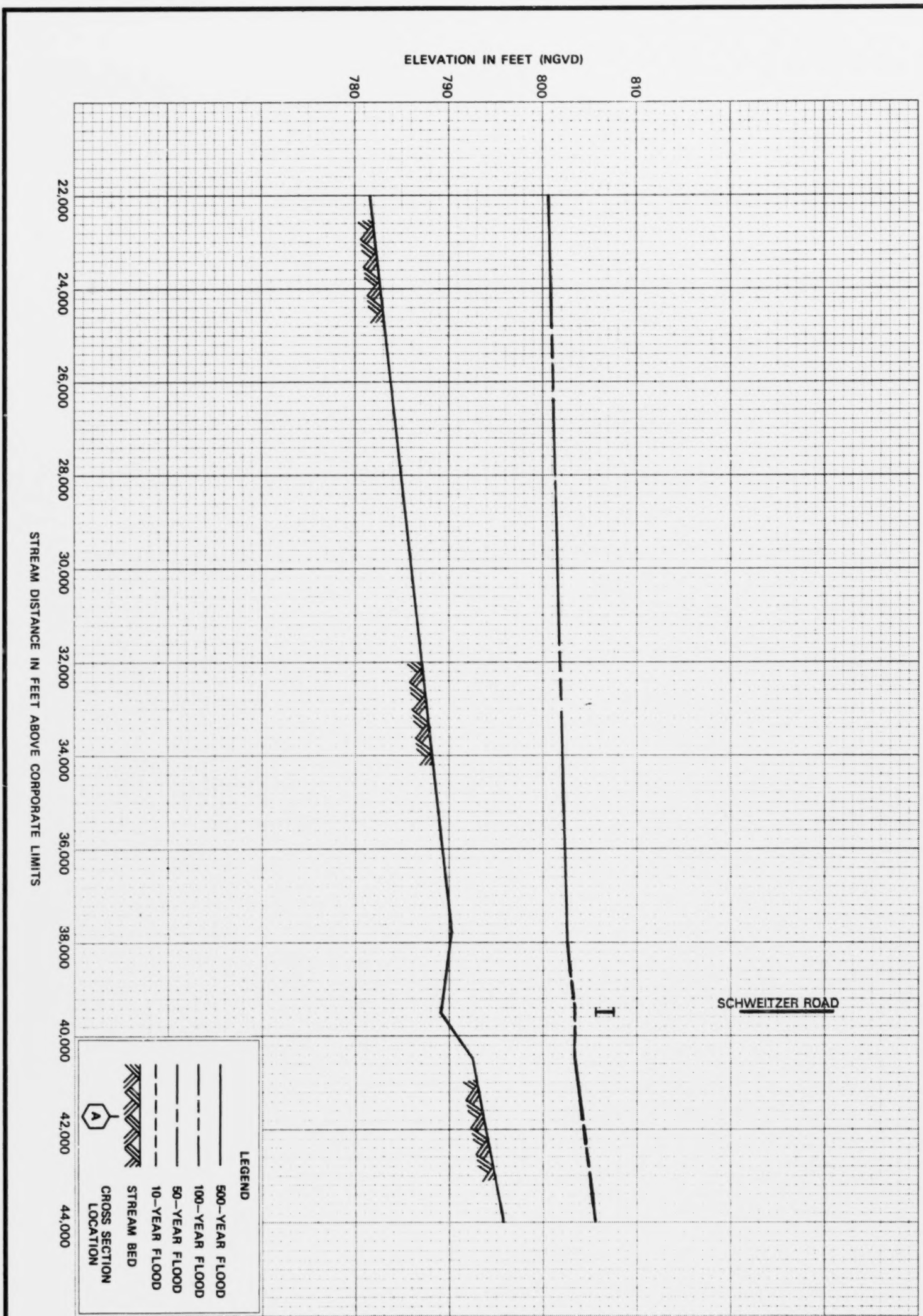
13. U.S. Department of Housing and Urban Development, Federal Insurance Administration, Flood Hazard Boundary Map, Township of Lockport, St. Joseph County, Michigan, November 1978.

ELEVATION REFERENCE MARKS

REFERENCE MARK	FLOOD INSURANCE RATE MAP PANEL	ELEVATION (FEET NGVD)	DESCRIPTION OF LOCATION
1	0005	825.17	standard iron post with bronze cap stamped "825" located on northwest corner of intersection of Holton Road and South River Road
2	0005	818.08	top of guardrail near two 0.25 inch cuts in guardrail, near midstream, on west side of Carpenter Road bridge over the Portage River
3	0005	811.98	spike in east side of power pole 200 feet north of the Portage River and 1,000 feet southeast of the intersection of Lovers Lane and Buckhorn Road



01P	FEDERAL EMERGENCY MANAGEMENT AGENCY **TOWNSHIP OF LOCKPORT, MI** (ST. JOSEPH CO.)	**FLOOD PROFILES** **ST. JOSEPH RIVER**



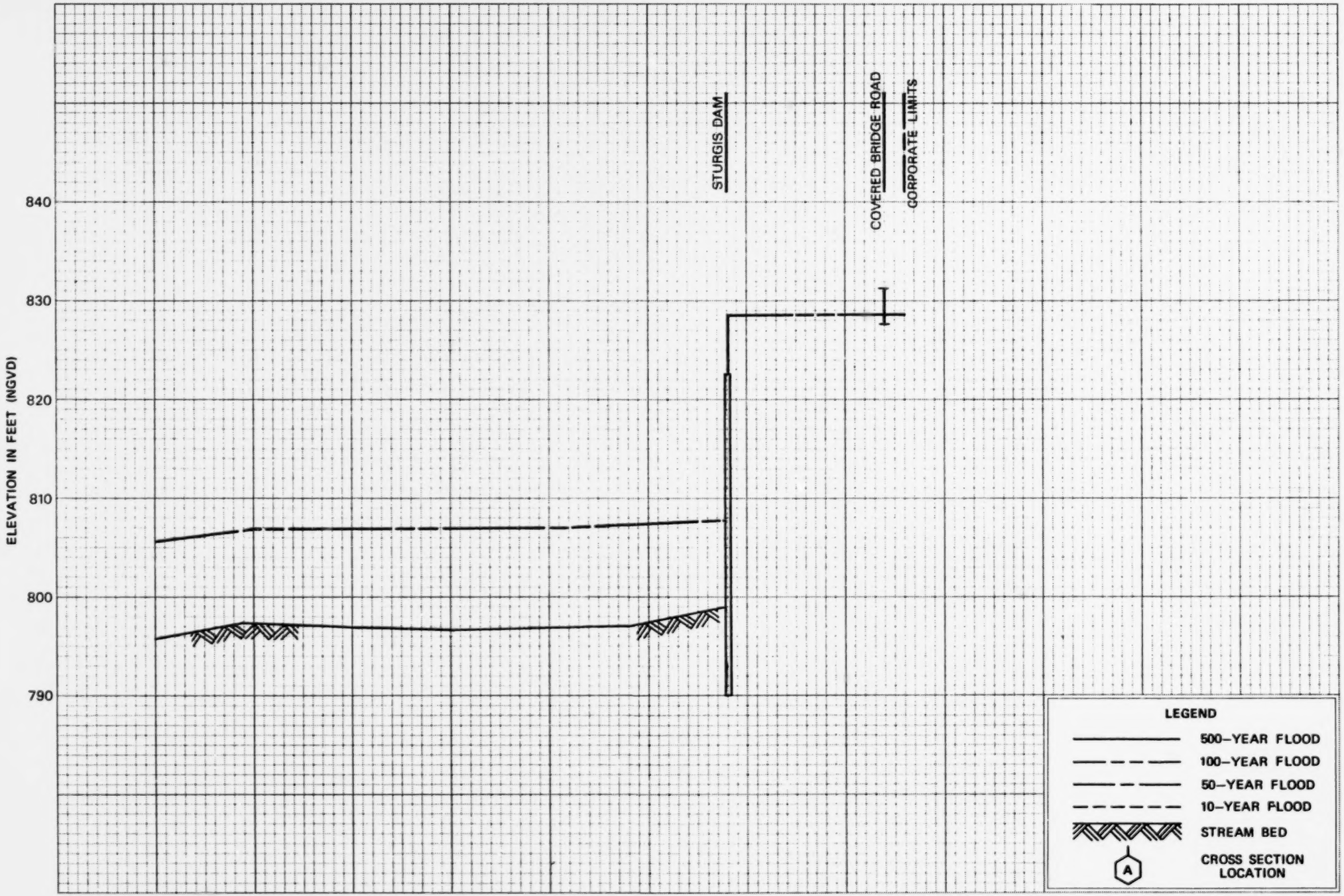
02P

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF LOCKPORT, MI
(ST. JOSEPH CO.)

FLOOD PROFILES

ST. JOSEPH RIVER



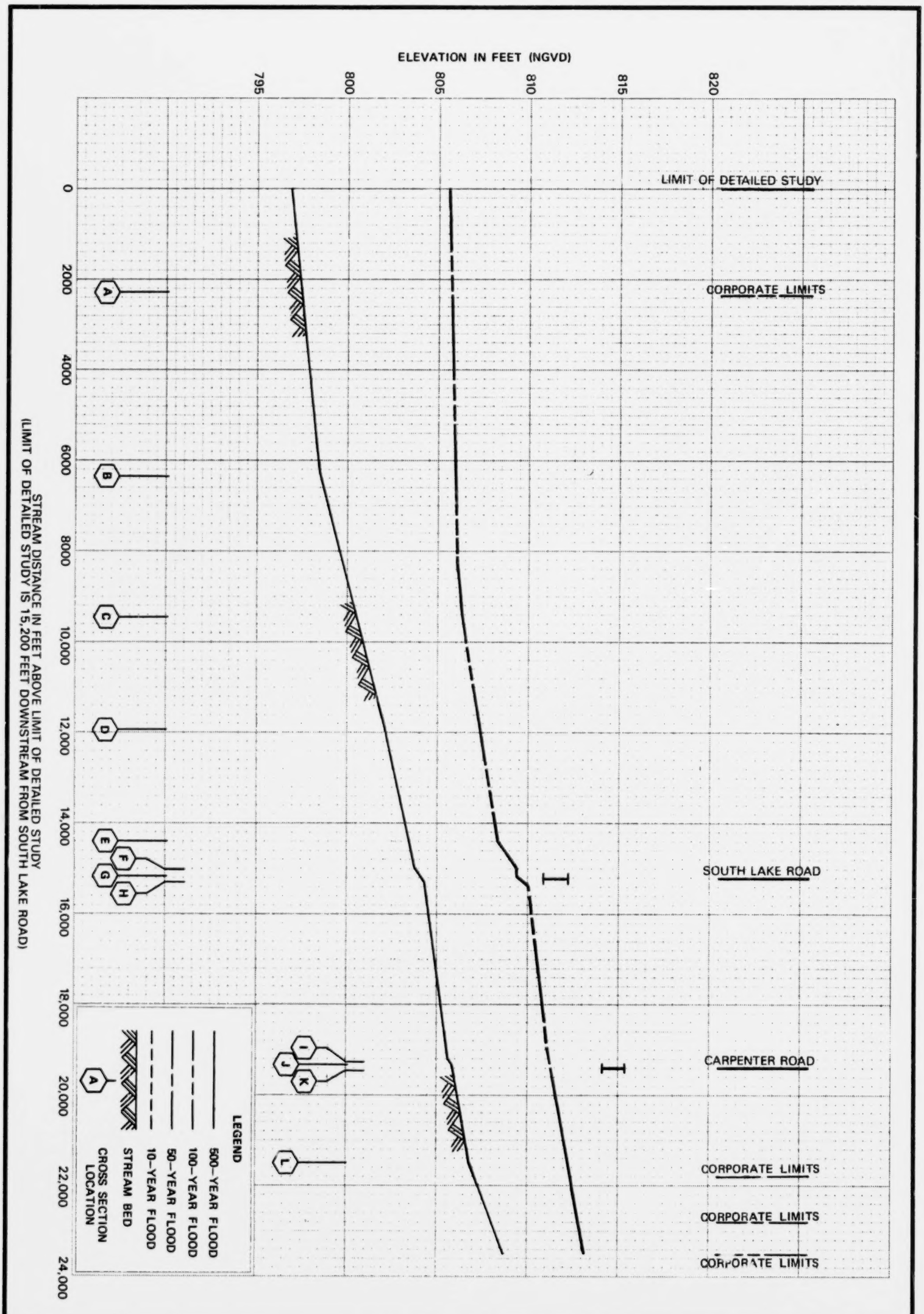
FLOOD PROFILES

ST. JOSEPH RIVER

FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF LOCKPORT, MI
(ST. JOSEPH CO.)

03P



FEDERAL EMERGENCY MANAGEMENT AGENCY

TOWNSHIP OF LOCKPORT, MI
(ST. JOSEPH CO.)

FLOOD PROFILES

PORTAGE RIVER

04P